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DIRECTIVES OF THE EUROPEAN UNION ON INTELLIGENT TRANSPORT SYSTEMS AND THEIR IMPACT ON THE REPUBLIC OF CROATIA

ABSTRACT

The paper analyzes the current guidelines of the European Union on deployment of Intelligent Transport System, as well as their importance for the development of the Croatian transportation system. The crucial problems of modern transport and traffic are indicated as: congestions and congestion costs, harmful emissions in road transport, fatalities, etc. The current state of Intelligent Transport System development in Croatia is presented based on the transport infrastructure, modern road telematic industry, and other supporting activities (including scientific research, educational activities, standardization system, etc.). The final part of the paper deals with the need and potentials for the development of South East European regional ITS architecture.

KEY WORDS

Intelligent Transport Systems, ITS Architecture, Trans-European road network, transport strategy, South East Europe

1. INTRODUCTION

The term *Intelligent Transport Systems* (ITS) has been introduced in transport and traffic engineering during the 1990s, and can be defined as holistic, control, information and communication upgrade to classical transport and traffic systems enabling significant improvement in the performance, traffic flow, efficiency of passenger and goods transportation, safety and security of transport, reduction of pollution, etc. The quality of implementing Intelligent Transport System is primarily based on harmonization and possible integration of individual solutions into integrated systems. The achievement of that is related to design of the basic system organization, the so-called ITS Architecture and definitions of the necessary standards by official organisations. The background for Architecture and standardization development in modern society can be usually found in legal documents of individual countries or international organizations.

ITS presents a crucial breakthrough by changing approaches and trends in transport and traffic research and technology aiming to solve the escalating problems of congestions, pollution, transport efficiency, safety and security of passengers and goods [1]. This is also proven by numerous programmes and projects related to ITS all over the world, the introduction of new study programmes on ITS and founding of ITS associations at national and global level. ITS replaced the previously used concept for transport problem solving (*build-only* concept) that had already been exploited. Increasing transport-related problems in interurban and urban transport raise the need for new approaches and new solutions.

The European Union created a legal framework for ITS development based on the recognition of ITS advantages and need for an EU wide harmonized development. First legal documents were related to specific solutions, but during the first years of the 21st century, general legal acts for each mode of transport were prepared. Adoption of legal document is, however, only the first step which is followed by standards adoption and activities realisation within deadlines that need to be respected. The legal document is often followed by Work plans or Communications dealing with its implementation. According to the EU legislation, the main reasons for ITS introduction are: improving safety, improving efficiency, reducing pollution, and enabling interoperability between different systems. Recently, the European Union has made some significant efforts in the field of ITS deployment trying to find solutions for the escalating transport and traffic problems. A great number of activities have been stipulated by different European bodies with the single objective – to enforce the practical ITS deployment all over the Union [2].

ITS applications are key tools to support efficient infrastructure management and traveller information on Trans-European road network (TERN). In order to maximise the benefits out of ITS deployment in South East Europe (including Croatia) SEE TPC (South East Europe Transnational Cooperation Programme) launched last year (2012) a new project SEE-ITS (Intelligent Transport Systems in South East Europe). SEE-ITS aims are stimulating co-operation and interoperability between isolated ITS applications so as to support the mobility seamlessly throughout TERN motorways, secondary, and urban/interurban road networks, as well as with their interfaces to other modes, such as surface public transport, ports and inland waterways. SEE-ITS will develop an institutional and technical framework through which SEE organisations and countries can harmonise ITS specifications and define generic collaboration model based on acceptable scenarios. Furthermore, the project will execute focused pilots to assess the scenarios, perform impact analysis, benefit by the ITS industry participation in the project and deliver a Regional Framework, a User Forum and a long term plan for viable future investments [3].

A review of European Union deployment activities in the area of Intelligent transportation system (particularly legal framework) and their influence on the Republic of Croatia is the main goal of this paper. The basic hypothesis of this article is that the Republic of Croatia has enough knowledge and experience to accept the new legal framework and technological challenging of new directions for research and development in Intelligent transportation systems. Previous experiences in the developed world have shown that it is a prerequisite to the successful deployment of ITS using an effective ITS architecture. Therefore, the basic features of the modern approach to ITS architectures worldwide are described in Section 2. ITS Action plan and Directive as European Union new Legal Framework for ITS coherent deployment are given in Section 3. In Section 4 an overview of previous activity and today's status of ITS development in the Republic of Croatia is given. On this information and current state of ITS deployment in European Union some possibilities in the future implementation of ITS in Croatia are given in Section 5. The concluding remarks and some recommendations for the ITS future in Croatia are given at the end of this paper.

2. DEVELOPMENT OF ITS ARCHITECTURE

Architecture can be defined as the basic system organisation consisting of crucial components, their relations, and connections to environment, as well as principles for system design and development during the whole lifecycle [1]. In order to enable the development and upgrades, complex systems have to include additional characteristics such as: Compatibility, Expandability, Interoperability, Integrability, Standardability [4]. The lack of architecture can result in difficulties because of incompatible components, higher cost for updates, and complications in introducing or adjusting new technologies. ITS architecture provides a general framework for planning, designing and implementing integrated systems in a given period and geographical area.

An ITS Architecture is important for a number of reasons:

- it ensures an open market for services and equipment, because there are "standard" interfaces between components;
- an open market permits economies of scale in production and distribution, thus reducing the price of products and services;
- it ensures consistency of information delivered to end-users;
- it encourages investment in ITS since compatibility is ensured;

- it ensures inter-operability between components, even when they are produced by different manufacturers, which is also good for SMEs (Small and Medium-sized Enterprises);
- it permits an appropriate level of technology independence and allows new technologies to be incorporated easily;
- it provides the basis for a common understanding of the purpose and functions of ITS, thus avoiding conflicting assumptions [5].

Based on the content and mandatory use, three main types of ITS Architecture are defined:

- Framework ITS Architecture;
- Mandated ITS Architecture;
- Service ITS Architecture.

Framework Architecture, most suitable for national level architecture, focuses on the user needs and functional viewpoint. This type of architecture can be also considered as a starting point for the development of other two types of architecture. Mandated Architecture consists of physical, logical and communication viewpoints but also includes additional outputs (Cost-Benefit analysis, Risk analysis, etc.) [4]. The contents of Mandated Architecture are strictly defined and, as consequence, the choices for deployment options are limited. Service Architecture is similar to Mandated Architecture, but includes services. Additionally, there are also physical and logical (functional) architecture. While the logical architecture consists of processes and interconnecting data flows, physical architecture includes physical components (parts of equipment) and related data flows. ITS architecture can live to its potentials only when logical architecture is based on the user needs, vision and operational concept, and when physical architecture is developed based on the logical architecture. Defining the physical architecture is strongly connected with standardization and implementation strategy.

2.1 Development of US ITS architecture

Initial standardization of ITS services, focused on road transport, was set up by ISO (International Standardization Organization). First reference model for ITS included 8 functional areas and 32 services (ISO TR 14813-1 - Transport information and control systems - Reference model architecture(s) for the TICS Sector) [1]. The reference models for ITS architecture were improved in 1999. Actual ISO 14813-1:2007 provides a definition of the primary services and application areas that can be provided to Intelligent Transport System (ITS) Users. Those with a common purpose can be collected together in ITS service domains, and within these there can be a number of ITS service groups for particular parts of the domain. ISO 14813-1:2007 identifies 11 service domains, within which numerous groups are then defined. The intention of new taxonomy is to relate similar and complementary ITS services. The taxonomy includes 11 functional areas:

1. Traveller Information;
2. Traffic Management and Operations;
3. Vehicles;
4. Freight Transport;
5. Public Transport;
6. Emergency;
7. Transport Related Electronic Payment;
8. Road Transport Related Personal Safety;
9. Weather and Environmental Monitoring;
10. Disaster Response Management and Coordination;
11. National Security.

Each functional area consists of interrelated services. Regional (US State) ITS architectures can include additional services and functions that are not listed in ISO taxonomy of services.

2.2 Development of European ITS architecture

The development of the European ITS architecture is the result of two projects funded by the European Commission: the KAREN project and the FRAME project. The FRAME project includes early ideas of the European ITS framework architecture with the following documentation:

1. European ITS functional architecture;
2. European ITS physical architecture;
3. European ITS communication architecture;
4. European ITS cost-benefit analysis;
5. European ITS implementation study;
6. ITS implementation models [1].

The European ITS Framework Architecture is designed to provide a flexible framework that individual countries can tailor to their own requirements. The national ITS Architecture projects based on the European ITS Framework Architecture, such as ACTIF (France), ARTIST (Italy), TTS-A (Austria) and TEAM (Czech Republic), therefore have a common approach and methodology, but each has been able to focus on the aspects of local importance and develop them in more detail [5, 6]. The FRAME project has continued as the new E-FRAME (Extend FRAMEwork) Architecture for cooperative systems. This new EU standard is needed to ensure compatibility and the ITS Architecture for Cooperative Systems is to be used to study the likely standardisation requirements and create a set of recommendations for the appropriate organisations.

There are significant differences between approaches in designing the ITS architecture in the world. US ITS Architecture is based on the physical viewpoint, the European architecture relies mostly on the users' needs and functional viewpoint, while Japanese national ITS architecture uses object-oriented methodology.

3. ACTION PLAN AND DIRECTIVE FOR ITS DEPLOYMENT

The action plan for the deployment of ITS can be considered as the document that initiated stronger and more focused ITS development in the European Union. Although there was a high level of harmonisation in strategic research supported by the European Technology Platforms ERTRAC and ERTICO-ITS, the framework for deployment of ITS in road transport was still to be designed [7]. The preparation of the Action plan included stakeholders' consultation, workshops, on-line survey (public debate) and discussion groups.

The introduction of the Action plan presents three major challenges:

1. Congestion and congestion costs;
2. Road transport related CO_2 emissions;
3. Fatalities.

The main policy objectives arising from these challenges are for transport and travel to become: cleaner, more efficient, safer, and more secure. ITS has been recognized as a possible solution, and the purpose of the Action plan is to accelerate and to coordinate the deployment of ITS in road transport, including interfaces with other transport modes. The potential of ITS could be realised only if its deployment in Europe is transformed from the limited and fragmented implementation into an EU wide one. The role of EU is to create frameworks that will include policy priorities, choice of generic ITS components, and clear timetable for specific activities [7].

The Action plan envisages six priority areas:

1. Optimal use of road, traffic and travel data;
2. Continuity of traffic and freight management ITS services on the European transport corridors and in conurbations;
3. Road safety and security;
4. Integration of the vehicle into the transport infrastructure;
5. Data security and protection, and liability issues;
6. European ITS cooperation and coordination.

Within six priority areas the total of 24 activities were defined (*Figure 1*). Priority areas were later partially transferred in Directive 2010/40/EU.

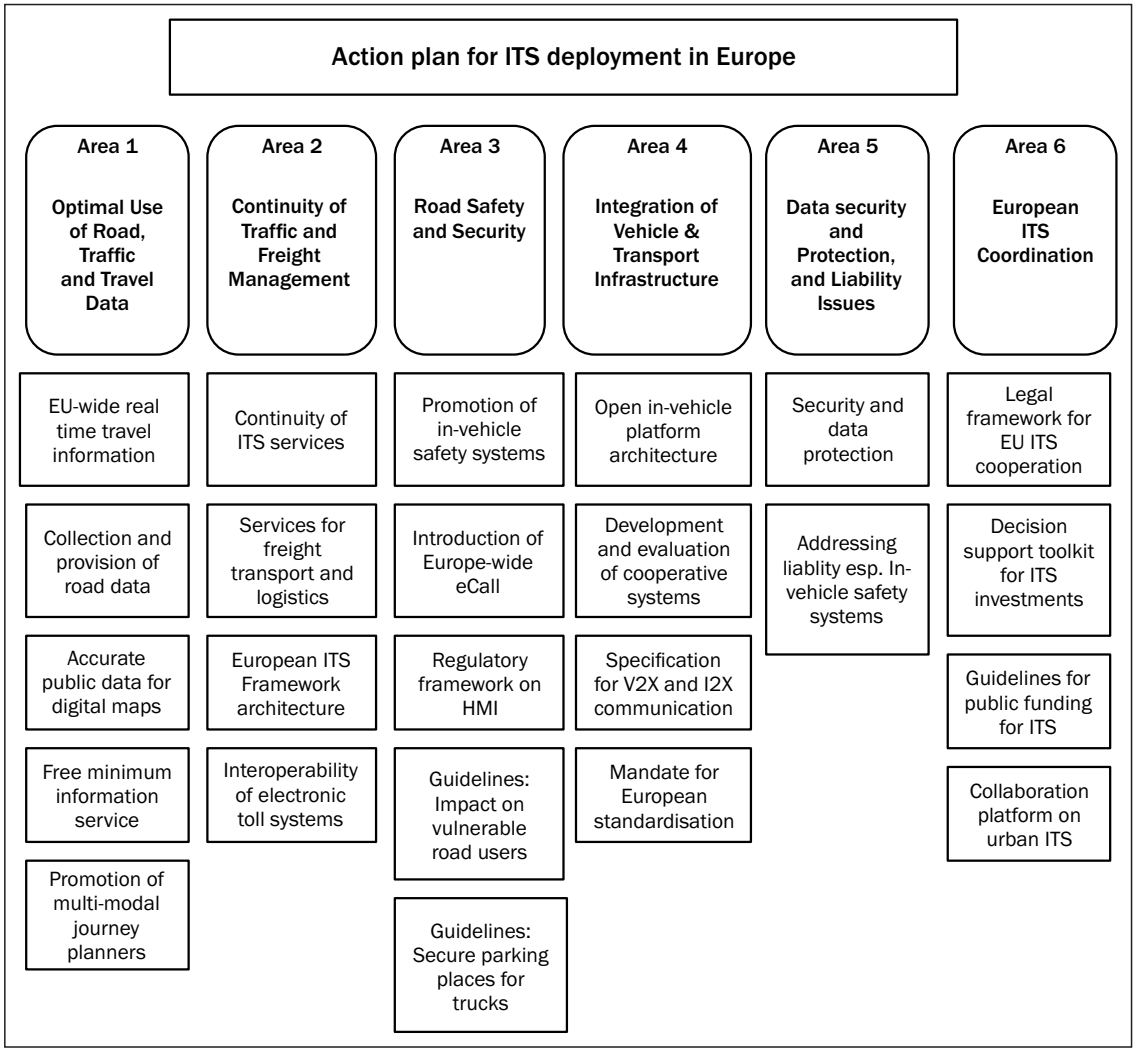

Figure 1 - Action plan priority areas and activities for deployment of ITS in Europe [7]

3.1 Directive 2010/40/EU

Directive 2010/40/EU is a general document for coordination of ITS development in the European Union [8]. Like other directives, it is not directly applicable in each Member state. However, it is the obligation of the Member states to adapt their national legislation in order to achieve goals set by the directives. The essential part of the document is the list of priority areas and priority actions, as well as plans with set deadlines. The basic objective of the Directive is the setting up of a framework for future activities which will consequently lead to the harmonisation of ITS development in Europe [9].

The adoption of specification for priority areas is the first step toward a harmonised development. Specifications will be developed individually and, depending on the area covered, they can include different types of provisions:

a) Functional provisions that describe the roles of various stakeholders and the information flow between them;
b) Technical provisions that provide the technical means to fulfil the functional provisions;
c) Organisational provisions that describe the procedural obligations of various stakeholders;
d) Service provisions that describe various levels of services and their content for ITS applications and services.

Special attention is given to data protection and it is stated that the member states are obliged to ensure fundamental rights and freedoms of individuals. National ITS legislative must ensure that personal data are protected against misuse, including unlawful access, alteration or loss. For these reasons, the use of anonymous data is encouraged.

The implementation of tasks from the Directive is assisted by the European ITS Committee (EIC). The European ITS Advisory Group is also established in order to provide advice on business and technical aspects of ITS introduction and deployment. The Advisory Group includes service providers, users, manufacturers, professional associations and local authorities.

3.2 Priority areas and priority actions

The Directive establishes four priority areas:

1. Optimal use of road, traffic and travel data;
2. Continuity of traffic and freight management ITS services;
3. ITS road safety and security applications;
4. Linking the vehicle with the transport infrastructure [8].

These four priority areas are also the priority areas of the Action plan for ITS deployment. *Data security and protection, and liability issues*, which was included in the Action plan, is not included in the Directive but references to relevant legislation framework are made. *European ITS cooperation and coordination*, the sixth area in the Action plan, can be considered as a general issue. The existence of the Directive itself proves the existence of the mentioned cooperation. Within the priority areas, six priority actions are defined:

1. Provision of EU-wide multimodal travel information services;
2. Provision of EU-wide real-time traffic information services;
3. Data and procedures for the provision, where possible, of road safety related minimum universal traffic information free of charge to users;
4. Harmonised provision for an interoperable EU-wide eCall;
5. Provision of information services for safe and secure parking places for trucks and commercial vehicles;
6. Provision of reservation services for safe and secure parking places for trucks and commercial vehicles.

Annex to the Directive describes the relationships between priority areas and priority actions. Three of them (1-3) are part of Area 1 (Optimal use of road, traffic and travel data), while the last three (4-6) are included in Area 3 (ITS road safety and security applications). For each priority action a specification will be prepared in order to achieve compatibility, interoperability and continuity of implementation and deployment of ITS applications.

3.3 Timeframe and legal limitation for ITS deployment

Based on the deadline set in the Directive, the Commission adopted the Working Programme in February 2011. The Programme incorporates a detailed time schedule for each priority action according to the articles of the Directive. For each action the following steps are to be taken:

a) Analysis and preparation (including external study, consultation with stakeholders and appropriate consultation with Member state experts);
b) Impact assessment;
c) Drafting of specification (including opinion of ITS Advisory Group and appropriate consultation with Member state experts);
d) Final draft and inter-service consultation;
e) Adoption.

Time schedule for each activity is prepared considering the current state of preparation and complexity of the processes. As an example, at the time of preparation of the Working Programme, the phase of Analysis and Preparation for priority action "*Harmonised provision for an interoperable EU-wide eCall*" had al-

ready been finalised. The longest period is foreseen for action named "*The provision of EU-wide multimodal travel information services*".

The two main limitations for ITS deployment are incorporated in the EU legislation: Personal data protection and National security. These limitations are not directly included in the legal framework for all modes of transport. For road transport the Member states shall ensure that the processing of personal data in the context of the operation of ITS applications and services is carried out in accordance with the Union rules protecting fundamental rights and freedoms of individuals, in particular Directive 95/46/EC and Directive 2002/58/EC. Although, the personal data protection is not always directly addressed in legal acts on ITS deployment, the protection is obligatory due to the existing EU legal framework. ITS applications should be without prejudice to matters concerning national security or which are necessary in the interest of defence.

4. STATUS OF INTELLIGENT TRANSPORT SYSTEMS DEVELOPMENT IN THE REPUBLIC OF CROATIA

The field of road telematics was strongly developed in the 1980s and 1990s by the University of Zagreb (Faculty of Electrical Engineering and Computing; Faculty of Transport and Traffic Sciences) and enterprises such as "Nikola Tesla" etc. At the end of the 1990s a group of transport and traffic scientists, led by professors at the Faculty of Transport and Traffic Sciences, recognized the importance of ITS and initiated a number of research projects supported by the Ministry of Science or other public bodies and public-owned companies (Research Centre for ITS; Institute for Intelligent Transport Systems, 2001 etc.). This resulted in the spreading of the ITS idea (the Croatian Institute for Construction – IGH, first business initiatives, etc.) [10].

4.1 Scientific and research capacities in Croatia

The formal beginning of ITS research and development (R&D) in the Republic of Croatia is related to 2005, when ITS, as a new branch, was included in the National Classification of Scientific Areas (2.12.05 *Intelligent Transport Systems and Logistics* in the field of Transport and Traffic Technology). In the same year the science and professional association ITS-Croatia was established and a new university study programme on Intelligent Transportation Systems and Logistics (at undergraduate and graduate level) has been accredited. In the same period, a number of scientific projects in the field have been initiated: *General ITS Models and their Reflections, Development Methods of Integrated Intelligent Transport Systems, Methodology for Development of Integrated Adaptive Transport and Logistic Systems*, etc. The experiences gained at the national level are also applied in international projects such as the CiViTAS ELAN Project in FP7 (7^{th} Framework Programme). Recently, significant efforts have been invested in the involvement of Croatian R&D resources in the European projects covering the area of ITS (Framework Programme VII, IPA development programs, South East Europe TCP, etc). Some of the current projects where RH is included are:

- Intelligent Cooperative Sensing for Improved traffic efficiency – ICSI (FP7 - Framework Programme 7);
- Intelligent Transport Systems in South East Europe - SEE-ITS (South East Europe Transnational Cooperation Programme - SEE TCP);
- Computer Vision Innovations for Safe Traffic - VISTA (European Regional Development Fund, IPA- ERDF);
- TU1102 Towards Autonomic Road Transport Support Systems, (COST Programme actions).

The current stage of science, research and educational capacities can be characterized as satisfactory; nevertheless, the insufficient connections of research and business entities can be still noticed as an obstacle. This general problem is addressed by a number of programmes on institutional and project level. As a supporting body, the Business Innovation Centre of Croatia – BICRO has been established. BICRO is a governmental agency for implementation of national programmes in the field of technological development. Its main task is to provide successful and efficient support to technological development and to commercialisation of research results. This is possible only based on the enforcement of relations between researchers and business and through ensuring financial, material and other necessary preconditions for innovation development. The importance and role of ITS and intelligent road telematics has already been recognized and supported by BICRO.

4.2 Legal framework

During the early pre-accession programmes Croatia focused its efforts on maritime transport and development of the Vessel Traffic Monitoring & Information Systems (VTMIS). Investments in rail transport were made during the entire pre-accession period and their peak is related to current time and pre-accession programme IPA, in which the funds for inland waterway transport are also allocated. After accession, the project related to all modes of transport will be eligible for co-financing.

The European legal framework has an important role for the Republic of Croatia being a part of the European transport network and the candidate country. During the negotiations, Croatia harmonised a significant part of her legal framework and initiated implementation of the specific information system. How-

ever, full compliance has still not been achieved (for example interoperability of road toll systems, introduction of information system for all modes of transport). The transport solution cannot be implemented without significant financial support, and access to European funds is limited by strict rules for the proposal and implementation of projects.

The Republic of Croatia is to become a member of the European Union on 01 July 2013. In accordance with the remaining legislative obligations for the acquisition and implementation of the EU acquis, a supplement to the existing Highway Act is currently underway as defined by Sections of the Directive 2010/40/EU. In addition, the adoption of an appropriate bylaw (Regulations on Intelligent transport systems in road traffic) is planned by the end of June 2013.

4.3 Status of actual road transport network

The latest progress in construction and modernization of highways and other infrastructure placed the Republic of Croatia on the very top in the region considering transport management system installed on highways and freeways. Modern transport-related information technology implemented on all the Croatian highways and some freeways (region of Rijeka and Split) enables continuous progress towards the integration of transport infrastructure management, *Figure 2*. This can be considered as an important step in achieving harmonised transport management in the region. The applied ITS solutions on certain highway sections are at a high technological level. For example, the systems for incident management on highways (especially in tunnels) have received excellent grades in the existing project on tunnel safety (European Tunnel Assessment Programme). Fifty-one tunnels were tested in 2007 and one of the tunnels on the Highway A1 ("Brinje") was determined to be the best in Europe. The Croatian tunnels have been graded as very good in the recent years. The application of VMS on highways is high, which represents a significant improvement in informing the users (drivers, passengers, etc.).

The basic problem with the current implementation is the lack of integration at higher instances (regional, national, EU). This leads to low levels of interoperability. Current data exchange methods are manual (e.g. the protocols on exchange of information on traffic and incidents with Slovenia and Austria based on fax machines). The use of DATEX standard (information exchange between traffic management centres, traffic information centres and service providers) has not been even planned for implementation.

A particular problem is the ongoing maintenance of the existing road telematic equipment. The current state of road telematic equipment maintenance is unsatisfactory due to the use of inappropriate methods and maintenance organizations (anachronistic approach). The problem of maintaining road telematic equipment on highways in Croatia can be significantly improved by using advanced maintenance models that are based on the intensive use of modern computer and information technology [11]. In this way one may rationalize the system of equipment manufacturers' support. In order to conduct proper maintenance of the existing road telematic equipment it is necessary to make appropriate steps to improve the old organiza-

Figure 2 - Tunnel Traffic Control Centre (Mala Kapela)

Source: ZG-Projekt Ltd.

tion of road maintenance (in preventive and corrective ways).The main dilemma is how and when to decide on the implementation of maintenance procedures, all in order to maintain high level of safety on the Croatian highways and at reasonable operating costs of maintenance. Certain steps in this direction can be done on some experience from similar systems maintenance (similar in their contents and organization structure). A model of information system to support road telematics maintenance systems on highways should comply with the guidelines of the European architecture of ITS and strategic development guidelines of ITS architecture.

4.4 Interests of the Croatian industry and economy

The implemented technology is mostly produced by domestic industry which is the additional benefit from highway (or other transport infrastructure) construction and modernization – significant growth of small and medium enterprises related to telematic equipment, based on research and development, designing, manufacturing, implementation and maintenance of telematic systems for different purposes. The technology for adaptive traffic signalisation and systems for centralized management are considered as the best example of verified and acknowledged products, not only in the region, but also on the global level. Some Croatian manufacturers have specialised in providing integrated technological solutions for advanced traffic management on highways, in tunnels or in the cities. Successful projects have been realised in Croatia and in more than 30 countries in the region and in the world.

ITS Development Strategy in the Republic of Croatia, especially the development of ITS in the cities (adaptive traffic control, public transport management, parking lines management, intermodal transport in big cities and ferry ports, convoy management) is strongly related to the realisation of major projects in transport system management. This should enable further development of small and medium enterprises focused on manufacturing management systems and telematic equipment for these purposes.

In the nearby future, it will be necessary to develop public-private partnerships which will enable cooperation of these two sectors in the development and implementation of various systems and provision of ITS services. The expected result of these partnerships is accelerated, economic and more efficient deployment of ITS and ITS services in the Republic of Croatia.

4.5 Standardization activities

The Croatian Standards Institute is an autonomous non-profit public institution established as the national standards body of the Republic of Croatia with a view to accomplishing the goals of standardization. The Croatian Standards Institute is a member of: International Organisation for Standardization (ISO), International Electrotechnical Commission (IEC), European Committee for Standardization (CEN), European Committee for Electrotechnical Standardization (CENELEC) and European Telecommunications Standards Institute (ETSI) (status: NSO member).

Technical committee HZN/TO 524 (Road transport and traffic telematics) is responsible for the area of ITS. It corresponds with ISO/TC 204 (Intelligent transport systems) and CEN/TC 278 (Road transport and traffic telematics).

The Croatian standards and other Croatian normative documents may be in the Croatian language and/or a foreign language. The original Croatian normative documents shall be drafted in Croatian and subsequently translated into a foreign language if necessary. If an international/European normative document is adopted as a Croatian normative document, it may be adopted in the original language and subsequently translated into Croatian, or it may not be translated at all. Over 120 standards have been adopted in the field of ITS.

4.6 Commercialization of ITS services

In Croatia there have been no significant initiatives for commercialization of ITS services and no private initiatives to implement ITS. Therefore, an implementation of ITS through public-private partnership is expected in the future. The area of Public Private Partnership (PPP) in the Republic of Croatia is regulated by the Public Private Partnership Act (OG 78/12) and the accompanying Regulation on implementation of Public Private Partnership Projects (OG 88/12), Concessions Act (OG 125/08) and the Public Procurement Act (OG 90/11) relating to the procedures for awarding the public procurement contracts and concession contracts.

In a wider sense the integral part of the legal system are other relevant sector acts regulating concessions.

The Public Private Partnership Act regulates the following: procedure of preparing and approving of the proposals for public private partnership projects, supervision of implementation of private public partnership projects, contents of public private partnership contracts and other important issues: Also, the Public Private Partnership Act regulates the competences of the Agency for Public Private Partnerships.

There are no organizational and structural barriers and problems related to the implementation of ITS in the Republic of Croatia. At the present state of development of ITS in the Republic of Croatia, the big-

gest problem is the lack of organizational conditions that would foster the application of ITS services in the state. The experiences of other countries in the EU suggested establishing a special department at the Ministry of Transport dedicated to the development and deployment of ITS. The goal of this department would be the development of methods and measures required to encourage the development and implementation related to ITS in the Republic of Croatia, as well as monitoring the performance of ongoing plans.

5. POSSIBILITIES IN THE FUTURE IMPLEMENTATION OF ITS IN CROATIA

As a candidate country, Croatia has to fulfil specific conditions including compliance of legal documents with the European legal framework (*acquis communautaire*). Negotiations related to this harmonisation have been conducted based on 35 chapters. Simultaneously, the European Union supports the necessary reforms in the pre-accession period providing co-financing through pre-accession funds. In the field of transport, international harmonisation is necessary even if it were not related to accession to the Union [9]. More precisely, the lack of harmonisation could cause obstacles in the traffic flows on the important Pan-European corridors (V and X) passing through Croatia.

At present, and probably in the next mid-term (2-5 years) the Republic of Croatia should expect major financial problems with the development and implementation of ITS. This is a consequence of the recent global crisis and the current economic situation in the Republic of Croatia. The future of the Croatian motorway concessions is also very uncertain, as the application of new models is expected with significant privatization in this area.

The Ministry of Maritime Affairs, Transport and Infrastructure intends to develop appropriate guidelines for the development of the priority areas of ITS. Within six months from the date of entry into force of the ITS supplement of the existing Highway Act, the Government shall develop guidelines for the development of the priority areas of ITS based on the proposed amendments of the Act:

A. Provision of EU-wide multimodal travel information services;
B. Provision of EU-wide real-time traffic information services;
C. Data and procedures for the provision, where possible, of road safety related minimum universal traffic information free of charge to users;
D. Harmonised provision for an interoperable EU-wide eCall;
E. Provision of information services for safe and secure parking places for trucks and commercial vehicles;
F. Provision of reservation services for safe and secure parking places for trucks and commercial vehicles.

For understanding the possibilities of ITS deployment in Croatia, particularly for decision-making in the future period, SWOT analysis is an acceptable tool. The SWOT analysis of ITS deployment in Croatia is done within the project "Intelligent Transport Systems in South East Europe – SEE-ITS". The main results of this analysis are:

Strengths:

1. Croatian R&D has the capability of developing new ITS applications and services;
2. Transport telematic private sector in Croatia has wide experiences in developing ITS technology and equipment;
3. There is high education level (internationally certificated) in the area of ITS;

Weaknesses:

1. Government has no strong policy and strategy in Intelligent Transport System implementation;
2. Recently, ITS deployment has focused at the low level system application, resulting in the lack of integration and inability to get synergy of combining systems;
3. Some duplication of recent ITS investment has occurred;
4. Most of the technologies that have been used in recent deployment require high maintenance cost;
5. Limited ITS capability and expertise of road operators and others in transport infrastructure sector. Need for a different approach (from traditional transport projects) for implementing ITS projects;
6. Small number of R&D domestic projects in the field of ITS;

Opportunities:

1. Croatia has important transport corridors in South East Europe;
2. Reducing traffic congestion and delays, and improving traffic flows by integrating traffic control and traveller information systems;
3. Local ITS researchers have a better understanding of local transport problems, limitations and behaviours;
4. Provision of advanced ITS technology for incident management on highways;
5. ITS has potential to improve safety by better utilization of automated enforcement technology;
6. ITS has very important potential to improve road safety (country image in tourism);
7. ITS has a very good solution for small tourist towns on the Adriatic coast with big traffic problems during the tourist season;
8. ITS as an export industry

Threats:

1. Continuation of global financial crisis and the problems of the domestic economy;
2. Ministry, government agencies and main (state) highway concessioners are interested only in their own mission, not in inter-agency coordination and sharing resources;
3. Procurement law is not suited to ITS projects, which need a focus on functional requirements rather than technology specification;
4. ITS developments in Europe are very rapid and local state user cannot adapt to changes of technologies.

The aim of SEE-ITS project is to prioritize the requirements for interoperable ITS along with regional, national and urban networks of SEE for integrated traffic management and ITS deployment at all levels. Regional and national studies for e-traffic taking into account the existing and foreseen systems will be conducted, an EU ITS Action Plan will be developed with regards to the needs for transnational integration. Moreover, proposals for the revision of the existing national ITS architectures and guidelines for developing ITS architectures will be presented in order to achieve open traffic management systems and interoperable applications and ITS services in the SEE region.

6. CONCLUSION

In order to achieve harmonisation of transport system with the European Union (which is one of the most important tasks), the Republic of Croatia should focus on the development of optimal ITS architecture (Framework Architecture, Mandated Architecture, Service Architecture). A possible solution is to take into consideration a wider approach – regional ITS architecture [12, 13]. This activity should propose guidelines for the revision of the existing ITS architectures in SEE countries. The approach to be followed for the successful implementation of the current task will entail the critical assessment of the existing ITS architectures actually implemented in the SEE countries, taking into account local, regional and national levels, specific per individual country. Then, a common revision plan, that will include the guidelines and proposals, will be elaborated, in order to ensure the interoperability of such systems within and across SEE countries, with special attention to standardization issues of ITS system architecture, following the respective European standards.

The current stage of science, research and educational capacities can be characterized as satisfactory; nevertheless, the insufficient connections of research and business entities can still be noticed as an obstacle. This general problem is addressed by a number of programmes at institutional and project level. As a supporting body, the Business Innovation Centre of Croatia – BICRO as a government agency for implementation of national programmes in the field of technological development should be very important in the future ITS development. Its main task should be to provide successful and efficient support to technological development and to commercialisation of research results. This is possible only based on the enforcement of relations between researchers and business and through ensuring financial, material and other necessary preconditions for innovation development. The importance and the role of ITS and Intelligent road telematics has already been recognized and supported by BICRO.

In the nearby future, it will be necessary to develop public-private partnerships which will enable cooperation of these two sectors in the development and implementation of various systems and provision of ITS services. The expected result of these partnerships is accelerated, economic and more efficient deployment of ITS and ITS services in the Republic of Croatia.

The existing and newly expected funding mechanisms should have an important role in achieving optimal ITS implementation and in developing interoperability between different South East regions. Next steps that need to be followed include the identification of a suitable bundle of measures for each country, the finalization and prioritization of the proposed interventions in order to reach a desired level of ITS services deployment and finally, the harmonization of ITS national strategies with EU ITS policy in order to achieve an accepted level of interoperability [14].

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SAŽETAK

DIREKTIVE EUROPSKE UNIJE ZA INTELIGENTNE TRANSPORTNE SUSTAVE I NJIHOV UTJECAJ NA REPUBLIKU HRVATSKU

U radu se analiziraju sadašnje smjernice Europske unije o uvođenju inteligentnih transportnih sustava, kao i njihovo značenje za razvitak hrvatskog prometnog sustava. Naznačeni su bitni problemi suvremenog prometa i transporta: zagušenja i troškovi zagušenja, emisije štetnih plinova u cestovnom prometu, smrtni slučajevi i sl. Prikazano je trenutno stanje razvoja inteligentnih transportnih sustava u Hrvatskoj na temelju prometne infrastrukture, industrije suvremene cestovne telematičke opreme i drugih potpornih djelatnosti (znanstvena istraživanja, obrazovne aktivnosti, sustav normizacije i sl.). Završni dio rada ukazuje na potrebe i potencijale za razvoj regionalne ITS arhitekture jugoistočne Europe.

KLJUČNE RIJEČI

Inteligentni transportni sustavi, ITS arhitektura, Trans-europska cestovna mreža, Transportna strategija, Jugo-istočna Europa

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